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CROSS REFERENCE TO RELATED APPLICATION

This application is a non-provisional application for United States Letters Patent under 35 U.S.C. 111 (a) of provisional application Serial Number 60/085,159, filed May 12, 1998.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a highly visible, easily deployed multiple hazard marker and multiple hazard marker system for breach lanes through a minefield, biohazard warning, chemical warning, buried power and fluid transmission lines, construction zones, surveying sites, flood warning, fire zone warnings, blasting zones and the like.

2. Prior Art Statement

Previous attempts to provide a marker for breach lanes through a minefield have resulted in at least two such markers known as the Air Impacement Marker (AIM) and the Impulse Cartridge Method (ICM). The ICM consists of a barrel assembly for accepting the pole like marker and a shell chamber for receiving an explosive shell. The pole like marker is adapted to be driven into the substrate to be marked, such as the ground, by firing the explosive shell within the chamber creating a driving force behind a top end of the pole like marker. Although suitable for earthen emplacement, utilization upon harder surfaces such as roadways is impossible. Furthermore, emplacement from the air, such as by helicopter, cannot be effected. Similar disadvantages exist with the Air Impacement Marker which is driven into the substrate to be marked by a short duration blast of a highly compressible fluid such as air. The AIM are small diameter fiberglass poles having a reflective surface upon a portion of the length of the marker pole. These poles are subject to easy breakage during the emplacement process as the marker pole bends upon impact with the substrate when fired from a moving vehicle and fractures along stress lines within the fiberglass pole. Therefore, a significant need exists for a marker system employing markers which are adapted to stand upright upon contact with the substrate to be marked and which may be deployed from a moving vehicle.

It is known to provide a single hazard marker such as a road safety marker having three legs

AA

bound together at the top thereof and at another location thereon with a lighting housing atop the three legs. For instance, see the Design Patent 389,078 issued on January 13, 1998 to Freeman, et al.

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Additionally, it is also known to provide a single hazard marker such as an emergency warning flag system to mark areas for use solely by emergency vehicles comprising a flag pole with a flag secured to the upper end thereof, a base unit and an attachment means extending downwardly from the base unit for securement to a ground surface. For instance, see the U. S. Patent 5,462,004 issued on October 31, 1995 to Clayton E. McGlothlin.

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It is also known to provide a single hazard marker such as a reflective element comprising a body member having optically reflective means on the outer surface thereof for attachment to a fence post. For instance, see the U. S. Patent 5,731,895 issued on March 24, 1998 to Owczarzak, et al.

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It is also known to provide a single hazard marker such as a traffic signal marker comprising an unbreakable elongated light transmitting tube containing two manually miscible chemical reactants affixed to a base member comprising first and second support members to maintain the light in an upright position. For instance, see the U. S. Patent 3,933,118 issued on January 20, 1976 to Lyons, et al.

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It is yet known to provide a single hazard marker such as a collapsible road hazard marker comprising a resilient spiral arm defining a collapsible body having a generally conical shape having an apex with a latch member mounted to the collapsible body at the apex and a base member for receiving the latch member. For instance, see the U. S. Patent 5,305,705 issued on April 26, 1994 to Greg R. Gagliano.

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The prior art describes a single hazard marker system such as a reusable road hazard warning system comprising an elongated flexible carrier having a plurality of road warning elements attached thereto and normally maintained retracted when the carrier is disposed in a storage mode, the warning elements being erectable when the carrier is payed out upon a road surface. For instance, see the U. S. Patent 4,522,089 issued on November 12, 1985 to Thomas P. Mahoney.

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Still known is to provide a single hazard marker such as an apparatus for marking the post-detonation safe area within an explosive terrain, the marking apparatus assembly including a housing means and adapted for delivery to the area by a remotely launched device, a means for ejecting the marking apparatus from the launched device, a plurality of marking means having means for extending associated therewith within the housing means and an initiating means for initiating the extension

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means by an external pressure source. For instance, see the U. S. Patent 4,969,398 issued on November 13, 1990 to Neal M. Lundwall.

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It is further known to provide a two-stage release self-righting mechanism for use in erecting a load from a side position to an upright position comprising an array of spring legs for attachment to the load and a pair of primary and secondary releasable holder assemblies. For instance, see the U. S. Patent 5,069,136 issued on December 3, 1991 to Axelson, et al.

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Another known single hazard marker is a deployable lane marker comprising a base, an illuminator and a frangible bracket releasably holding the illuminator in a lowered position on the base. For instance, see the U. S. Patent 5,592,898 issued on January 14, 1997 to John G. Korpl.

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It is also known to provide an apparatus for deploying single hazard markers from a self-propelled land vehicle comprising at least one vertical shaft adapted to hold a stack of foldable markers in a folded position, a delivery gate at the lower end thereof, a means associated with the shaft for biasing the stack of markers toward the delivery gate, means associated with the gate for sequentially releasing markers. For instance, see the U. S. Patent 4,747,515 issued on May 31, 1988 to Kasher, et al.

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It is further known to identify certain hazards by spectroscopy. For instance, see the article by Caffrey, et al., "Chemical Warfare Agent and High Explosive Identification by Spectroscopy of Neutron-Induced Gamma Rays", IEEE Transactions on Nuclear Science, Vol. 39, No. 5.

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Also known is to detect certain biological hazards using a surface transverse wave resonator. For instance, see the article by McGowan, et al., "Biological Agent Detector using a Surface Transverse Wave Resonator: Preliminary Report", 1994 IEEE MTT-S Digest, TU4D-4.

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It is further known to neutralize CW agents. For instance see the article by Yu-Chu Yang, "Chemical Reactions for Neutralising Chemical Warfare Agents" published in the 1 May 1995 issue of Chemistry & Industry, Vol. 8, pp 334-337.

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Known sensors and circuits are described in the book by Joseph J. Carr, Sensors and Circuits published by Prentice-Hall, Englewood Cliffs, NJ, 1993.

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It is known to detect mines in a mine field with electronic means. For instance, see the article by Earp, et al., "Ultra Wideband Ground Penetrating Radar for Detection of Buried Metallic Mines", appearing in IEEE AES Systems, Sept. 1996, Vol. 11, No.9.

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Finally, it is known to detect mines in a mine field by an airborne minefield detection and

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reconnaissance system. For instance, see the article by Andre G. Lareau, "Flight Performance of an Airborne Minefield Detection and Reconnaissance System", Photogrammetric Engineering & Remote Sensing, Vol 57, No. 2, February 1991, pp 173-178.

SUMMARY OF THE INVENTION

5 It is an object of this invention to provide a multiple hazard marking system comprising a deployment vehicle, a deployment surface, a plurality of multiple hazard markers and means to deploy the multiple hazard markers carried by the deployment vehicle, each multiple hazard marker having a means for standing erect upon the deployment surface, a means for visibly marking a location on the deployment surface, a means for visibly signaling the presence of physical hazards, a means for
10 determining the presence of ABC hazards and a means for communicating.

A further object of this invention is to provide a multiple hazard marker system consisting of at least one multiple hazard marker, a deployment vehicle, a communication system, a deployment surface and a means for deploying the multiple hazard marker, the multiple hazard marker comprising a surface engaging portion, an upper portion and a central portion, a means for remaining erect when
15 deployed associated with the surface engaging portion, a means for marking a position upon a field where deployed associated with the upper portion, a means for collapsing or expanding associated with the central portion, a means for signaling, a means for activating associated with the means for signaling and a means for transmitting associated with the means for activating wherein the means for deploying the multiple hazard marker comprises a means for collapsing the multiple hazard marker,
20 a means for retaining the multiple hazard markers contained therein and at least one means for releasing the multiple hazard marker.

Yet another object of this invention is to provide a multiple hazard marking system which may be deployed by aircraft for marking the boundaries of a minefield wherein the mines in the field have been detected by ground penetrating radar or a thermal signature.

25 It is yet another object of this invention to provide a multiple hazard marker having means to remain erect on an even or uneven surface when deployed, the means to remain erect associated with a surface engaging portion and comprising a plurality of deployable leg elements the leg elements having means for engaging the deployment surface.

30 It is another object of this invention to provide a multiple hazard marker having a self aligning mounting to align the mast vertically upon deployment and a plurality of deployable leg elements each